U.S. ARMY RESEARCH OFFICE

BROAD AGENCY ANNOUNCEMENT

DAAD19-03-R-0005

Institute for Collaborative Biotechnologies

February 2003

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Due Date for Receipt of Proposals:
Not Later Than 1 May 2003

All submittals are due by 4:00 p.m. local time on the above date

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1. Introduction

This Broad Agency Announcement solicits proposals for the establishment of a University Affiliated Research Center (UARC) to be known as the Institute for Collaborative Biotechnologies (ICB). The ICB will conduct research in three areas; (1) sensors, electronics and photonics, (2) soldier health and performance, and (3) technical fundamentals and enabling tools, to provide the interdisciplinary fundamental knowledge needed for increased mission capability through superior weapon systems and soldier survivability.

Through a competitive process, the Army Research Office (ARO) expects to award a single non-fee bearing contract having an initial performance period of five years. The resulting contract will include provisions for task orders estimated to reach approximately $40,000,000 over the five-year term. The award is projected for fourth quarter fiscal year 2003. The anticipated basic research effort is to be funded with FY-03 through FY-07, 6.1 RDT&E funds.

The selection process will comprise evaluation by technical peer review. **The deadline for submission of proposals is 4:00pm ET on May 1, 2003** (see Section 5.3 Submission Information for details).

2. Concept for the Institute

The Army is in the process of a transformation to the Objective Force making it more responsive, deployable, agile, versatile, lethal, survivable, and sustainable than today's forces. The Objective Force requires revolutionary advances in soldier-centered capabilities to enhance health and performance of the soldier and to improve his communications and sensing capabilities. Advances in engineered systems capabilities are also required. These relate to weapons technology and platform design breakthroughs to improve force projection and protection, and full spectrum situational dominance. See the "Objective Force White Paper" at http://www.objectiveforce.army.mil/) for further description of Army future operating capabilities.

Biotechnology is a critical technology for the Army and the Department of Defense (DoD). The Army seeks to provide the interdisciplinary fundamental knowledge and technical capabilities to manipulate biological systems and components, and to exploit biologically derived products and processes for both the soldier and engineered systems and platforms. Recent remarkable advances in biotechnology suggest breakthrough capabilities in the area of biologically derived "smaller, lighter, faster" functional materials for advanced sensing and information processing. The Army payoffs are in the areas of precision strike, signature management, "identification friend or foe", chemical and biological defense, counter-terrorism and other areas. Likewise, rapid progress in biotechnology promises radically new contributions in the area of soldier health and performance. For that reason the Army is creating a University Affiliated Research Center (UARC) entitled the "Institute for Collaborative Biotechnologies" (ICB).

The ICB will conduct unclassified scientific research in three areas of emphasis: (1) sensors, electronics and photonics, (2) soldier health and performance, and the (3) technical fundamentals

enabling development of advanced capabilities in these application areas. A single university will host the ICB. The Institute's research concepts must be compatible with Army mission requirements, limited energy resources, communications needs, and rugged insensitivity or adaptive responsivity to extremes of temperature, humidity, storage, damage, mechanical shock, impact and soilage.

The ICB will conduct research in areas not typically emphasized by very much larger programs at the National Institutes of Health (NIH), and throughout the Pharmaceutical and Health Sciences industries which have a more medically-oriented mission. ICB will draw upon the advances made throughout that biomedical research of NIH and will complement rather than duplicate those types of contributions. The Army intends to emphasize the full integration of life, physical, engineering and information sciences. The ICB will work in close collaboration with industry, the Army Research Laboratory (ARL), the Army Soldier Biological Chemical Command (SBCCOM - including both the Natick Soldier Center and the Edgewood Chemical and Biological Center), as well as the Army Medical Research and Materiel Command (AMRMC), and other Research, Development and Engineering Centers (RDECs) in pursuit of the Army's goals.

The ICB host will be selected through a competition limited to universities. The selected university may elect to include up to two other universities where inclusion of the expertise at the other university or universities would considerably enhance the submission by the host university through complementary research activities well integrated by means of strong collaborative networking tools. The host university will be awarded a contract and designated a University Affiliated Research Center (UARC). The award will be made for approximately $8M annually. The university host will provide appropriate facilities for this UARC and, along with its industrial partners, will commit significant infrastructure, resources, and personnel to complement the government's investment. The university will create cooperative partnerships with industry that will ensure the technical innovations emerging from the research will transition rapidly into militarily relevant applications and result in producible technologies. Partnerships with industry are a key factor in the success of ICB. Industry partners are expected to place personnel at ICB, to bear the cost of their on-site personnel, and to co-invest in the development and/or operation of the UARC.

The interrelationship between the selected university, industry and the Army is expected to evolve over the lifetime of the Institute. The UARC will be expected to aggressively garner industrial participation to accelerate the transition of novel concepts developed at the ICB into Army-fielded products. The management of the UARC must provide a flexible means for managing the industrial participation and adapting to change. A criterion for selection will be a comprehensive and compelling plan for creating innovation and managing technology transition from the laboratory to practical innovative applications.

3. Proposal Structure and Content

Proposals submitted in response to this solicitation shall include three volumes: the Research Program Volume, the Program Management Volume, and the University Commitment and Cost Volume. The Research Program Volume shall address the technical aspects of the work to be performed, identifying how research innovation will be accomplished to include an outreach plan for the UARC. The Program Management Volume shall address how the UARC will be managed internally and within the larger university context. A technology transition plan will be contained in this volume and must indicate how the UARC will coordinate and collaborate with the ongoing

Army research activities and how it will attract and interact with industrial partners to accomplish technology transition. The University Commitment and Cost Volume shall provide the budget and document the university and industrial commitment to the UARC. Among the required elements are descriptions of the facility and infrastructure to host this UARC as well as any in-kind cost sharing or co-investment proposed by the university and its potential industrial partners.

3.1. Research Program Volume

3.1.1. Background

The Army's Objective Force is a full spectrum force organized, manned, equipped and trained to be more strategically responsive, deployable, agile, versatile, lethal, survivable, and sustainable across the entire spectrum of military operations from Major Theater Wars through Counter-Terrorism to Homeland Security. A vital component in achieving these objectives is the enhancement of the soldier, physically tough and mentally conditioned for combat, and the world's finest warfighting technology. The ICB is intended to address provision of the biotechnology necessary to enable that combat effectiveness across the full spectrum of current and future military operations.

3.1.2. Research Program Objectives

The ICB will be chartered to conduct unclassified basic research in the three over-arching research areas of (1) sensors, electronics and photonics, (2) soldier health and performance, and the (3) technical fundamentals enabling development of advanced capabilities in these application areas. The ICB will address biologically-derived functional electronic, magnetic and optical materials; integrated multi-modality sensing; functional biological to non-biological interfaces; biologically-derived power and energy; and sense and respond actuation capabilities. The aim of this research is to provide a means to create unique biologically-based materials, processes and systems, and an ability to exploit these, for use as (1) entirely new components of advanced information processing and other engineered systems, or as (2) novel structures and functions complementary to the human as a system.

The ICB will also conduct research into innovative approaches to sustain soldier health and performance. Research may include status monitoring with adaptive input/output mechanisms; signal generation, transduction, and amplification in living cells and cell systems; and enabling interface communication between living and non-living materials, processes, and systems. The ICB will serve as the Army's focal point for basic research into biotechnology for application to unique Army needs. In addition to the first two research areas of the ICB, the Institute will also address basic fundamental issues. This research will develop physical and biological tools to allow the discovery, construction and characterization of biological systems. These tools will enable the development of complex multi-scale dynamic and predictive models of applicable biological systems.

The Institute will provide a cadre of technical expertise, providing basic research and related support to the Army's intramural and extramural applied research. Activities within the ICB will represent core bioengineering sciences capabilities providing the foundation for cooperative research with industry, the Army Research Laboratory (ARL), the Army's Soldier Biological Chemical Command

(SBCCOM), the Army's Medical Research and Materiel Command (AMRMC), and other Research, Development and Engineering Centers (RDECs). This will enable the transition of new technologies from the laboratory to new products for Army engineered systems, or for the soldier, and to spin-off commercial applications. A large, well integrated research facility, fully networked with collaborative tools, is envisioned to house world-class scientists and an exceptional research infrastructure.

3.1.3. Research Topics

3.1.3.1. Introduction

In nature, coordination of biological function at the molecular, cellular and systems level takes place by remarkably effective communication and information transfer. For example, at one end of the physiological continuum for "sense and respond" function for example, in a biomolecular catalytic pathway, there exist mechanisms whereby products of one enzyme-catalyzed reaction "talk" to another enzyme as part of a biosynthetic pathway. This communication feature being tightly connected both spatially and temporally enables the control of the rate of that synthesis. Concurrently, regulatory elements in various interconnected pathways act in concert to effect the necessary biochemical and biophysical state at the molecular level. Likewise, at the other end of that "sense and respond" continuum in a human endocrine gland pathway, there exist mechanisms for tightly coupled regulation of production and/or release of neurochemical factors that serve to exert positive or negative feedback control on production and/or release of that hormone. Again, regulatory events tightly coupled spatially and temporally act in concert to effect the necessary physiological state integrated at the cellular and systems level.

Other examples of these types of biological communication pathways operating at the molecular, cellular or systems levels abound, e.g. metabolic and genetic regulation, high fidelity gene repair, neurotransmission, and serve as the biochemical and biophysical basis for intracellular and intercellular information flow in diverse systems ranging from single cell micro-organisms to the human brain. Similarly, biology uses the information content of its macromolecules to control in highly regulated fashion the assembly of hierarchically ordered structures both for structural and functional materials, where the process of information flow might not ordinarily be thought of as "communication" or "information processing". Yet that is precisely what is being performed by certain biological macromolecules able to recognize and then direct the placement of other atoms or molecules in formation of these structures.

Efforts aimed at continuing the growth of technologies in genomics, proteomics, bioinformatics and related areas play a very important role in providing incremental advances in biotechnology. However, research dedicated solely to these types of efforts are adequately supported at funding agencies with budgets that far surpass those of the Army. These tend to be driven by medical applications for the most part and often miss the opportunities presented by biotechnology driven not by medical applications only, but by the entirely new science and enabling technology that arise from more generally applicable approaches.. These include: (1) unique combinations of technical approaches addressing interactions between the biological and non-biological world at the molecular, cellular and systems level, and (2) unique combinations of conceptual and experimental tools for creating remarkably effective descriptions of processes and products found only in biology.

Through well-integrated interdisciplinary basic research studies, it is expected that the ICB will enable communication, information processing, and other fully functional physicochemical interfacing between biological systems and non-biological systems. Such advances would take full advantage of state-of-the-art micro- and nano-electronics, magnetics, mechanics and optics. The ICB will also conduct research to support the development of innovative approaches for sustainment of soldier health and performance, i.e. status monitoring with adaptive input/output mechanisms, signal generation, transduction, and amplification in living cells and cell systems.

Army laboratories and centers which have core interests in biotechnology are the Army Research Laboratory (ARL – including the Sensors and Electronic Devices Directorate [SEDD], the Weapons and Materials Research Directorate [WMRD], the Human Engineering Research Directorate [HRED], and the Computer Information Sciences Directorate [CISD]), the Army's Soldier Biological Chemical Command (SBCCOM - including both the Natick Soldier Center [NSC] and the Edgewood Chemical and Biological Center [ECBC]), as well as the Army's Medical Research and Materiel Command (AMRMC). Background on current and emerging interests of these Army laboratories and centers is available at the following web sites:

http://www.arl.army.mil
http://www.sbccom.apgea.army.mil/RDA/ecbc/rt.htm
http://www.natick.army.mil/soldier/index.htm
http://mrmc-www.army.mil/

One additional website reflecting the interests and activities of another Army research center relevant to establishment of the ICB is the Night Vision and Electronic Sensors Directorate of the Army Communications Electronics Command (NVESD/CECOM):

http://www.nvl.army.mil/.

Likewise, two Army-funded university centers have interests that intersect biotechnology. These include the Institute for Soldier Nanotechnologies (ISN) at the Massachusetts Institute of Technology, and the Institute for Creative Technologies (ICT) at the University of Southern California. Information on these Army Institutes may be found at the following web sites:

http://web.mit.edu/isn/
http://www.ict.usc.edu/

Three research concentration areas described below should serve as points of consideration for planning the ICB. The offeror is encouraged, however, to identify research objectives and technology transition plans based on their own conclusions, and the perceived strengths of their own facilities and personnel, within those three overarching research concentration areas. To be effective the Institute will need the flexibility for the research program to develop and evolve over time in response to changing requirements and initial research results.

The research requirements have been divided into two broad categories addressing Sensors, Electronics and Photonics, and Soldier Health and Performance, and include as well a third category addressing the necessary Technical Foundations, namely: Tools to Enable Discovery, Construction and Characterization, and Complex Multi-Scale Dynamic and Predictive Models. The offerors may

structure the technical proposals as either a single, large research program or as a collection of separate, though interrelated, research tasks. It should be noted, however, that the intent of this program is to fund a multidisciplinary center with a single focus and purpose. **A collection of loosely related tasks by individuals or small groups that do not show significant integration, coordination, and synergy will not be considered responsive.**

3.1.3.2. Cross-Disciplinary Biotechnology: Sensors, Electronics and Photonics

The offeror must specify a research plan that identifies a variety of biotechnological solutions providing research opportunities to address biologically-derived functional electronic, magnetic and optical materials; integrated multi-modality sensing; functional biological to non-biological interfaces; biologically-derived power and energy; and sense and respond actuation. Biotechnology in the 21st Century serves as a "capabilities generator" for a substantial number of Army-relevant application areas enabled through a research focus on Sensors, Electronics and Photonics. Capabilities included here would include, but not be limited to some of those described below.

The necessity for a technology enabling molecular manufacture for smarter, faster electronic, magnetic and optical (EMO) devices is well recognized. The limit to precise manufacture of reproducibly functioning quantum confined materials for advanced electronics, optoelectronics and magnetics is fast approaching. The use of conventional integrated circuit techniques involving lithography followed by etching has limited success in producing the ultrasmall defect-free structures that are needed for these advances. The possibility exists that biomolecular based self-organizing processes for highly regulated deposition of appropriate materials might serve as a means of better control for uniformity of size and quality and emergence of desired properties. The production of "generation after next" ultra-high density, exceptionally rapid information processing device structures may hold promise of biotechnology application. The information technology industry requires non-lithographic methods to prepare billions or trillions of well controlled structures with near atomic precision, and the method to manufacture this is self-assembly. Understanding that biological systems perform self-assembly with complexity, diversity and efficiency second to none may be a key enabling technology for the nanotechnology revolution.

Biotechnology provides a base for "from-the-ground-up" macromolecular manufacture of uniquely structured EMO functional materials using genetically encoded biochemical determinants for biological self-assembly processes to drive structure formation. Because of enhanced capabilities in the areas of small, smart and fast device performance and high density information processing, this area of biotechnology would provide for a wide variety of advances in electronics, optoelectronics and communications applications for the DoD. Taking the example of prevention of fratricide, i.e. identification friend or foe, a strong contribution could be made for error-free targeting in smart munitions, as well as for "non-target" signature identification/designation. Both of these applications would be enabled by increased speed and capacity for processing relevant information, in addition to reduced size.

The objective of the scientific research addressed here would be to explore radically new biologically derived techniques for conceptualization, design, synthesis, and supramolecular structure fabrication. In natural biological systems, biological macromolecules exhibit extraordinary molecular recognition and signal transduction capabilities, and exert exceptional control over assembly and pattern formation processes that should prove useful for more effective sensing and

information processing technology as well as for an entirely new EMO functional materials fabrication technology. For example, research aimed at design of biologically based building blocks for nucleation and patterning of electronic and magnetic materials on nanometer-length scales in 2D and 3D structures enables the hierarchically ordered construction of faster and more efficient sensor and electronic device elements. Selection of peptides with high affinity for specific semiconductor structures and crystal orientations using molecular recognition, together with rational design of peptides and peptide block polymers to bind and assemble semiconductor and magnetic nanoparticles, is the key approach for fabrication of structures impacting the design and manufacture of macroscopically ordered addressable storage arrays or circuits, light emitting displays, optical detectors and lasers, and fast interconnect nanometer scale computer components.

Likewise, functional materials derived from photodynamic proteins promise to have superior photochromic, optoelectronic or non-linear optical characteristics useful for application in advanced devices and coatings. Research on genetic engineering of the light activated protein bacteriorhodopsin (bR) is enabling the development of novel and greatly improved holographic and other optical and electronic device-related materials. The ease of changing bR protein structure by site-directed mutagenesis and the inexpensive production of large quantities of pure protein make bR an attractive material for device fabrication. Major contributions expected to result from computational analysis in structure prediction for directed evolution of protein structures should vastly improve the possibilities for deriving well-defined function as necessary. Through genetic engineering, a family of proteins based on bR has already been shown to have novel properties of interest to the sensor, optoelectronics and information storage research communities, i.e., integrated spin-polarized and bacteriorhodopsin-based optical devices and holographic memory storage. The extended implications of enhanced information processing technology for contributions to trace chemical detection of toxic chemicals and explosives and to high-sensitivity detection and identification of biological threats is recognized as well.

Revolutionary concepts for sensing both on the battlefield and in counter-terrorism and other homeland security types of operations are needed. For cellular and biomolecular recognition based paradigms, both generic and highly selective sensors would play a role for remote and local (point) sensors. Characterization of entirely new candidate mechanisms and substrates for signal generation and transduction would be warranted. These could be cellular, sub-cellular or molecular in nature, and would preferably incorporate a valid means of training for detection and identification of unexpected target analytes. Algorithms based on computational neurobiology with automated learning for highly adaptive sensors might be involved. Sensor arrays fabricated on integrated “chips” with built-in initial signal processing would be useful.

Success in the area of sensors, electronics and photonics, especially their integration, could enable a means of multi-modal human threat detection. Studies on initial receptor-mediated events (i.e., molecular recognition, signal generation and transduction processes), stimulus representation, and neural pattern computational analysis might provide “lessons from nature” on how one sense operates in conjunction with other senses to provide exquisitely processed information, in parallel with other input, to define a specific target of interest on the micro or macro scale, e.g. a molecule or a man, in a cluttered environment.

In the realm of sensing and processing of other information, i.e., the electromagnetic spectrum, it is recognized that much insight can be provided through study of biological systems. One example

relates to the possibility of capturing a capability for what could be referred to as "smart bullet" mini-missile guidance. Insect vision represents a visual system embodying spatial, spectral, and polarization sensitivity and sensitive movement detection. Additionally neural coding strategies deal extremely effectively with contamination by noise. Understanding the means by which insects and some related organisms see would provide engineering insight for improved passive imaging system capabilities needed for superior target acquisition.

In a related area of research emphasis, that of biomolecular, cellular, and systems-based "sense and respond" mechanisms, a thorough investigation of environmental adaptation as it occurs in nature could provide enhanced survivability capabilities. Many animals exhibit extraordinary "sense-and-respond" adaptive capabilities that provide very useful situation-specific properties enabling enhanced survival in difficult environments. These protective features and underlying biochemical and biophysical concepts could perhaps lend themselves to incorporation into entirely new approaches to weapons system engineering and platform design and operation.

Through all of the above topics, the interface between biological and non-biological devices is an important recurring theme. Both bio-organic/inorganic and organic (chemical)/bio-organic material interfaces are important. Issues of connectivity of devices and sub-systems into integrated sensor system function need to be studied, and this might include development of biomolecules as circuits (electronic or optical).

3.1.3.3. Cross-Disciplinary Biotechnology: Soldier Health and Performance

The research plan for the center needs to address support for development of innovative approaches to sustain soldier health and performance. This would include such research topics as physiological status monitoring with adaptive input/output mechanisms; signal generation, transduction, and amplification in living cells and cell systems; and enabling interface communication between living and non-living materials, processes, and systems. The end product could be, for example, individually tailored self-activating therapeutics. Research here might be aimed at developing self-contained microsystems able to autonomously provide pharmacological response tailored specifically for any particular pathogenic or chemical threat. Likewise, it would be advantageous to have an individual and command-integrated soldier monitor. Research here would address how a self-contained health and performance status monitoring system might be biologically based and physically configured to enable measures of appropriate indicator molecules accessed internally or externally in a minimally invasive manner. "Self-contained" would refer to the ability of such a system to operate autonomously. This would provide readings for not only what and how much should be present for the "norm", but also what should not be present, e.g. excess metabolites, various toxins, etc. These readings could be either actively supplied to the soldier for response, or autonomously processed, and provided to the soldier and also linked to his unit to enable unit-wide monitoring. The means by which physically interfaced soldier input/output performance enhancement might be accomplished would also be useful. This would necessitate identification of specific neuronal and other cell-to-cell signaling pathways, or biomolecular signal transduction events that are involved in central nervous system information processing systems. These pathways can be accessed non-invasively by physical means to effect changes in sensory, motor, or cognitive performance. It would include provision for manipulation of key neurophysiological properties to enable performance optimization.

Closely related to the concerns described above, there is a need for research to address sustained performance and recovery. The emerging battlefield permits non-stop communication, sensing, and mobility, all serving to provide crucial tactical and operational advantage. In order for the warfighter to be available for full-time operations, both sustainment of functions (metabolic, physiological, and perceptual), and regeneration of function-supporting cellular structures, well beyond levels currently achievable, are necessary. The physiologic and metabolic limitations of human performance need further exploration. Examples include how to maintain oxygen availability or minimize depletion of neural responsivity while minimizing fatigue effects. For cases when overwhelming fatigue, injury, or physicochemical insult does occur, implantation materials that foster cell, tissue, or organ repopulation with degraded function recovery would need to be developed.

Development of new biomaterials and approaches to tissue engineering would be required. Candidate materials would have non-immunogenic properties, and be degraded during the process of repopulation. Such systems are available for human dermal tissues, but that research is not currently envisioned as extending to other soft or highly specialized tissues. A number of innovative routes exist for establishing sources of pluripotential human cells that may grow into almost any kind of fully differentiated cell type. Some progenitor cell types are not terminally differentiated. These may be induced to differentiate and grow, with appropriate manipulation of the cell environment, as mature cell lineages functioning like those found in adult tissues of various phenotypes.

Likewise, there exists exceptional promise in applying the rapid advances being made in physical and engineering sciences to modeling, design and construction of hybrid "natural", i.e., whole cell, systems incorporating truly functional and structural connectivities between biological and non-biological system elements. With appropriate multi-disciplinary research into biological generation and physico-chemical support, such a functional collection of cells exhibiting tissue-like behavior would provide groundbreaking capabilities for a tailorable platform or organizing template for tissue engineering.

To the extent that these biotechnology approaches can sustain and recover a fatigued or injured soldier, the same approaches might be examined for application to actually enhancing performance. For example, while it is currently possible to remap functions from damaged portions of the motor cortex to other areas of the brain to regain motion, it may be possible to "overmap" functions to provide increased motor control, enhanced vision, enhanced attention or cognitive processing. Similarly, it may be possible to develop new links within the musculo-skeletal tissue system to form heretofore-unavailable complementary muscle groupings for enhanced strength, control, and sustainment. Knowing the chemical demands of enhanced recovery and performance at the cellular level will provide additional soldier protection and performance enhancement.

Research in biotechnology that would enable inducible soldier protection and casualty prevention is needed. A better understanding of hibernation, together with related bioengineering sciences approaches to "hypometabolic state" induction, offers conceptual insight to enhance soldier survivability in harsh environments and in response to injury. The purpose of research here would be to engineer a state of suspended animation or hypometabolism to prolong survival after traumatic injury, or protect against exposure to biological or chemical agents. This may also be used to reduce performance limitations, e.g. to weather and time. The identified biochemical strategies may be applied to cells, tissues, limbs, organs and ultimately the war fighter. What conditions will enable cells, tissues and/or organisms to achieve and reverse the state of suspended animation? Significant

headway towards this goal may be achieved by understanding existing biological systems that use hypometabolism/ suspended animation. The applications of this technology will include improved transport and storage of cells, tissues, limbs and organs. Such technology would greatly reduce costs of Army logistics. Further applications will enable survival in the face of conditions or injuries that are presently fatal. Also useful would be other biologically derived systems that respond to occurrence of traumatic injury via autonomously activated generation of substances that enable a quick fix to the problem, e.g generation of self-actuating tissue-compatible protein resulting in blood vessel constriction, clotting, etc.

Protection of the soldier from biological and chemical toxic substances in his or her environment requires a means for contamination avoidance, whether this contamination is present in the soldiers' food and water or introduced purposefully as an operational threat. This in turn necessitates a method for high fidelity detection for enhancing awareness of the presence of these threats. There now exists real promise for the design and synthesis of cell- and biomolecular-based detection systems that capitalize on rapidly emerging advances in the understanding of biomolecular recognition and signal transduction processes and amplification possibilities.

Research is needed to provide for innovative approaches toward direct generation of a detectable optical, electronic or mechanical signal by virtue of the inter- or intramolecular event itself, and for the fundamental theoretical underpinnings. New detection capabilities might be enabled by use of biologically derived signal transduction and amplification processes. Studies are needed to provide a generally applicable structural basis for potential indirect signaling pathways utilizing such concepts as induced conformational change. Such concepts would rely on the ability of threat agents to promote structural reorganization in or around the cellular target receptor where the toxic effect occurs. In cell systems these would include, but not necessarily be limited to, genetic regulatory elements, ion channel and other membrane protein complex targets, enzyme or other macromolecular subunits of physiological signal transduction and amplification pathways, chemically or genetically engineered molecular mimics of such systems, and so on. Examples include: use of gene transcriptional activation for production of signalling event; use of intramolecular conformational change induced by specific toxic agent class binding interaction to elicit signalling event; use of specifically induced protein-protein association, or dimerization, to produce transducible recognition event; use of nanometer scale displacements or force generation induced by biological or biomimetic target specific macromolecular interactions to produce electronic, optical or optoelectronic signal.

One example for a molecular based system for detection might address the potential of using the interactions of spin waves and polarized photons to provide unique signatures of many different target analytes. In this scenario spin-based light emitting diodes would be used to probe bioreceptors in a microarray configuration exposed to suspected bioagents, polarization detectors to detect the signal, spin FET (field effect transducer) and memory devices to process the signals, and spin quantum computers to provide the necessary identification. The labeled, aligned bioreceptor-microarray may consist of genetically manipulable and combinatorially selective biomolecular recognition units. These units would conformationally be responsive to a threat agent-binding event involving specific reaction of each spin-coupled sub-element. This would confer absolute specificity for each individual reaction based upon the particular spin-coupled properties of that subelement. For this, and for many of the other types of devices impacting soldier health and performance, it is likely that research in bioelectrochemistry will provide a means of exploitation of biologically based photo- and electro-

dynamic events for enabling entirely new considerations of power and energy generation, e.g. enzymatic reactions at electrodes for biofuel cell application.

3.1.3.4. Technical Foundations: (1) Tools to Enable Discovery, Construction and Characterization and (2) Complex Multi-Scale Dynamic and Predictive Models

It is expected that the synthesis, modeling, and characterization tasks will progress synergistically toward the creation of a new Army-centric biotechnology. Because this combined effort serves as an important technical foundation of the activities of the entire Institute, the research plan must explicitly address how these tasks will be integrated into the whole of the center's effort to address the research topics of sensors, electronics and photonics, and soldier health and performance.

3.1.3.4.1. Tools to Enable Discovery, Construction and Characterization

Biology offers several advantages over traditional systems for the construction of novel materials. These include self-assembly, template-directed assembly, replication, exploitation of molecular diversity, and the ability to screen and select from amidst this diversity. To fully exploit these advantages, new tools and techniques are needed to enable design, controlled synthesis, and characterization. Although individual successes have recently been reported, the capacity for massively parallel material discovery and characterization, i.e., generation via combinatorial mechanisms, has not yet been realized. To harness the inherent advantages of biological systems, they must be interfaced with non-biological materials. Constructing these interfaces has hitherto been difficult because electrical/mechanical/optical systems have typically not been designed to accommodate the aqueous biochemistry of living systems. However, the inherent adaptability of biological systems (particularly the affinity, specificity and reversibility of molecular interactions) is ideally suited for the development of such interfaces. Self-assembly provides the structural control necessary to bridge the length scales between individual molecules and macroscopic materials. Whereas traditional chemical methods are effective for the design and synthesis of individual molecules, and traditional materials science techniques have enabled fabrication of macroscopic structures, generating ordered structures at the mesoscale has proven difficult. Biology, on the other hand, uses self-assembly to organize structures at levels ranging from macromolecular assemblies to entire organisms. Future efforts will harness the inherent capability of biological systems for self-assembly to generate novel and functionally useful materials.

As research explores new possibilities for application, the concurrent development of biotechnology for both product and process will be a topic of critical importance for the Institute and will be a primary focus of research into enabling unique improvements in advanced device function and soldier health and performance as described above. The Institute will focus on the discovery, construction and characterization of revolutionary materials, systems-of-materials, and enabling processing strategies. This is an area in which industry partnering is expected to be particularly relevant, with industry researchers participating in the basic research program (under industry sponsorship). The expected tasks directed at development of tools to enable discovery, construction and characterization of novel materials, processes and systems may include activities aimed at analysis, lab scale and rapid bulk synthesis and scale-up, characterization of physical (optical, electronic, magnetic, mechanical) properties of cells and cell systems and their structural and functional materials and their metabolites. This research will generate new materials and processes, genetically engineered materials or components of materials or synthetic pathways, metabolically engineered materials and processes and

combinatorial approaches. For example, there seems to be a growing body of evidence for the emergence of photodynamic protein based molecular memory for rapid and accurate information processing and storage. It is very likely that parallel advances in the tools of combinatorial genetics-based directed evolution and structural biochemistry will enable generation of pre-designed tailor-made photonic materials which will be amenable to scale-up manufacture.

High density, fault-tolerant, electronic, magnetic and optical elements for information processing need to be developed. For this, there is a parallel requirement for biologically derived synthesis, production, and handling of relevant biological substrates as building blocks, with directed- or self-assembly of functional nanostructures. Also needed is a capability to scale-up fabrication and manufacturing techniques, based on the biological processes, providing the foundation for generating hierarchical order using these structures. Construction of heterobiopolymers for electromagnetic spectrum reactivity, and for applications to chemical, biological and optoelectronic "sense and respond" device elements represent much of the needed developmental work in support of the areas described above. Presumably, application of revolutionary concepts for control of crystal nucleation and growth, and for control of polymeric structure mediated through protein and other biological macromolecular complexes, would play a role here, as would surface-programmed assembly of these biological molecules.

In the area of the man/machine/materials interface, work should lead to affordable and durable diagnostic materials. Included here might be in-suit medical diagnostics, wherein biochemically active components embedded in the warfighter's clothing would indicate, for example, injury or other form of threat to health sustainment. Also included would be DNA-based methodologies to identify combatants for "identification friend or foe" (IFF) and other uses. Inherent in biological systems is a built-in ability to detect damage, and perhaps that could be exploited to provide residual life indicators for structural and functional materials. Inherent also in biological systems is a capability for system components to adapt structurally and functionally to changing conditions, and perhaps these types of systems might offer insight for design and operation of new classes of adaptive materials. Development of biologically derived or biologically inspired multifunctional materials might include adaptive materials able to change properties in response to environmental conditions, and would involve research on integrated "sense and respond" function for protection against physical, chemical and biological insult. Built-in communication and power source function would be most useful, and development of a revolutionary biologically-derived means to provide energy to microsystems might be addressed through studies of cellular energy source capture or combinatorial protein design. There is promise in the use of biomolecular motors for microscale power and actuation. In cells, mechanochemically active biomolecular machines generate piconewton force and provide highly regulated movement at the nanometer scale. By virtue of the insight and supramolecular engineering strategies to be gained by study of these extraordinary biomolecular motor systems, the promise of unique contributions to miniaturized power and actuator systems seems great. For these and many other applications, work is needed on coupling elements for interfacing the biological to non-biological world and the interface properties necessary to enable these possibilities.

Functional interfacing plays an essential role in energy management of biosystems, which involves the integration of components for energy generation, storage, conversion, and consumption. For example, to optimize the energy management, a feedback and control mechanism is necessary to maintain the proper level of energy supply in the system. Such a mechanism may be learned and

mimicked from biological systems such as living cells. In particular, understanding of the signal generation, transduction and amplification mechanisms in living cells can provide invaluable insight into the optimal design approaches of energy management in biotechnology. Another important aspect in energy management is to integrate different components in the system. This includes interfacing between power generation and power consumption through actuation, and the conversion, modulation and transport of different types of energies. For example, direct coupling/conversion between biochemical, optical, mechanical and electrical energies at the single-molecule level as exhibited in living systems may significantly simplify energy management. For scale-up systems involving a large number of subunits such as bio-molecular motors or bio-fuel cells, it may be necessary to modulate and transport energy in order to drive any load. Here again, a fundamental understanding of the design principles and mechanisms in bioenergetics will be critical.

3.1.3.4.2. Complex Multiscale Dynamic and Predictive Models

Biological phenomena typically contain many variables that interact in a complicated way over many scales in space and time. Vast amounts of biological data have been collected over the years --- data that span scales from the microstructure of the gene to the macrostructure of control systems for physiological processes. The data sets are typically very large, multi-dimensional and seemingly random. For example, both the extremes of the very small and very large contribute to the dynamical range of the warfighter, from genetically determined traits to physiological responses. To understand the relevant biological processes requires building complex dynamical models that can extract functionally meaningful parameters from the appropriate data sets. The mathematics of nonlinear dynamical systems may prove to be useful in this contest, both to model the apparent "noise" (chaos) in such data sets and to explore the sensitivity of phenomena to the couplings across scales. For this reason, mathematical modeling, and engineering enablers for application to technology development, are required within the context of ICB objectives. Activities in this area would include, but not be limited to, complex dynamical models and nonlinear data set analysis, as well as pathway analysis and engineering for cell and cell system processes and operating principles.

Engineering tools (modeling and experiments) for the design of biologically derived systems need to be developed. This involves the development of accurate modeling capabilities that can be used to understand and predict complex biological phenomena and material behavior at different scales that span from the gene level to the cell level. These predictive capabilities need to be integrated with experimental measurements and observations, such that reliable guidelines can be developed for the synthesis of fail-safe engineered systems. In particular, we need to learn how to integrate systems and control the interface between living and non-living materials and systems at all temporal and physical scales and develop an understanding of the effects of mechanical forces and stresses on biological materials at the molecular scale. For example, there is a need to understand how closed loop biologically engineered systems can be self-energized in different environments and how dominant physical mechanisms interact at different temporal and spatial scales for both the biological system and host systems.

A great deal of research has been directed toward methodologies to scale from the macro to micro environments but little work has been done on scaling up from the molecular level to devices. Engineering models that would allow design, reliability predictions or multiscale predictions for system integration does not exist. This involves the development of accurate modeling capabilities that can be used to understand and predict complex biological phenomena and material behavior at

different scales that span from the gene level through the cell level to the systems level. These predictive capabilities need to be integrated with experimental measurements and observations, such that reliable guidelines can be developed for the synthesis of fail-safe engineered systems.

It is expected that predictive phenomenological materials modeling will be developed. Such fundamental tools for modeling will provide a means for relating material properties and architectures to performance. It is expected that these models can in turn be developed into design tools that will allow novel materials to be contemplated, analyzed, and optimized prior to their fabrication and characterization. The ICB will take advantage of computational models to enable optimal use of the power of genetic mutational manipulation for achieving desired results. Application of computational analysis for structure prediction in combinatorial methodology such as directed evolution of novel or enhanced native protein function would serve as but one example.

3.1.3.5. Outreach Plan

A significant outreach effort is expected to accompany the research program. The Outreach Plan should outline the primary means by which the research developed at the Institute will benefit the Army and be made available, possibly through the Institute's industrial partners, to the outside biotechnology community. The Outreach Plan should emphasize the mechanisms by which these connections are made and the types of scientific and technical exchange anticipated. By contrast, the Technology Transition Management Plan, developed in the Program Management Volume of the proposal, will specify the mechanism by which technology transition will be managed by the Institute to the Army and industry partners. There are several technical objectives of the transfer of science and technology. A key objective of the Outreach Plan will be to bring together those generating the research with those likely to be able to exploit it, before the research is committed or even formulated. There are a number of directions by which a promising innovation may be exploited. Networked collaborations are encouraged to accomplish both outreach and technology transfer aims.

3.1.3.5.1. Outreach to the Army

The first and most important aspect of the Outreach Plan will be the Institute's interaction with the Army and with industry. A critical role of representatives from Army laboratories in keeping the UARC focused on Army goals is recognized, and it is expected that attention would be paid to establishing the means to address this role. While innovation and creativity will be the key product of the university, advanced development and systems integration is the responsibility of the Army. The Institute will be expected to coordinate on a frequent and regular basis with the Army's scientists and engineers involved in R&D for the Army. Of primary importance is the interface with the Army Research Laboratory (ARL), the Natick and Edgewood components of the Army Soldier Biological Chemical Command (SBCCOM), and the Army Medical Research and Materiel Command (AMRMC). Information about these laboratories and their current activities may be found at

http://www.arl.army.mil
http://www.sbccom.apgea.army.mil/RDA/ecbc/rt.htm
http://www.natick.army.mil/soldier/index.htm
http://mrmc-www.army.mil/

For example, the establishment of a personnel exchange program would allow researchers from Army laboratories to work at the ICB facilities. The Outreach Plan should specify the various means by which research activities and results are communicated to, and coordinated with, the Army.

3.1.3.5.2. Outreach to other Sponsored Research Activities

The Institute is also expected to interact cooperatively with relevant Army, DoD, and other Federally-sponsored university and industrial research programs that bear on the mission of this UARC. The offeror will be expected to become familiar with other related research activities sponsored by the Army and DoD (Multidisciplinary University Research Initiatives, Collaborative Technology Alliances, Institute for Soldier Nanotechnologies, Institute for Creative Technologies, etc.), including DARPA, as well as by other government agencies (NIH, NSF, NASA, DoE, , etc.). The offeror must become technically cognizant of the progress of these activities, and the potential impact of these activities, on the Research Plan. An aggressive Outreach Plan must identify these other activities, specify the types of coordination to be undertaken, outline a strategy for assessing research results from other centers, and incorporating them into the Institute. Indeed, it is envisioned that the ICB will serve, through implementation of innovative collaborative tool use, as a fully networked "hub" to help assess and coordinate all extramural cross-disciplinary biotechnology research on behalf of the Army, and will synergistically and cooperatively leverage these investments.

3.1.3.5.3. Industrial Partners

The ICB will create cooperative partnerships with industry to ensure that the technical innovations emerging from the research will transition rapidly into militarily relevant applications and result in producible technologies. The Institute must work directly with its industrial partners in transitioning technology for potential large-scale manufacture. An outline of how such a technology transfer component might be integrated into the technical aspects of the program should be provided. The goal is for the Institute to join with the Army, other government customers, and the industrial partners to bring technology from the research program to a point where producibility can be demonstrated. The Outreach Plan must specify the types of interactions planned between the Institute and its industrial partners to ensure that developed biotechnologies are manufacturable, practical, and affordable. In addition, the Outreach Plan should indicate the anticipated role of entrepreneurial activities that will be spawned in support of the Institute's mission. The Outreach Plan must address the efforts the ICB will take to seek out transition opportunities with industry, both existing and entrepreneurial.

3.1.3.5.4. Outreach to Expand Base of Customers and Partners

The Institute is expected to serve as a vehicle to respond to the Army or other government customers who have requirements for the expertise and/or results emerging from the research program. Because the outreach of the Institute will not be restricted to the Army, the Outreach Plan should outline activities to identify research needs and opportunities, and encourage research investment, of other government agencies and industrial partners.

3.1.3.5.5. Education and Relevance

To accomplish some of the outreach objectives, it is anticipated that the offeror will propose such activities as seminars, symposia, workshops, special studies, and short courses. These should be specifically targeted at educating and training scientists and engineers from both the Army and industry on the latest developments and technological implications of the ongoing research. The Outreach Plan should clearly specify all such anticipated activities. A critical role that the ICB will play is to grow the U.S. talent base in cross-disciplinary bioengineering sciences and biotechnology. Although foreign national graduate students and researchers are welcomed and expected to play a important role in the research, the ICB is strongly encouraged to recruit outstanding graduate students and post doctoral researchers who are U.S. citizens, perhaps through the creation of a fellowship program. The Outreach Plan should specify the plans by which potential U.S. citizen researchers are recruited to the ICB and how any proposed ICB Fellowship program for U.S. citizens will be operated.

3.2. Program Management Volume

3.2.1. Introduction

The contractor is required to develop a five-year management plan to ensure that essential biotechnology capabilities of particular importance to the Army are fostered, developed, and maintained. The plan shall include provisions for approving and modifying the research program to achieve the mission requirements of the Army. This plan is to include management of the Institute 's research and technology transfer programs as well as cost controls and the development of a cost share program as industrial involvement develops. This plan shall incorporate a strategy for the inclusion of industry within the Institute and the management of research and development efforts including commercialization of the technology. The objective for this plan is to present an agenda that is scientifically sound and accountable, and ensures that the essential biotechnologies of particular importance to the Army are developed. This plan will incorporate interchanges on a regular schedule with the ARO program manager and with Army research personnel on a continuous basis by means of collaborations with Army staff. A majority of the research projects selected by the Institute should have vigorous and active technical collaborations with Army scientists and engineers. The plan will incorporate a means of providing periodic reporting to, and review by, higher level Army management officials. This approach is intended to accelerate the incorporation of new technologies arising from the Institute's research into Army systems development. Explicit mechanisms for external peer review of individual university research tasks must be included in the plan.

3.2.2. Internal UARC Organizational Structure and Plan

The Management Plan will indicate the internal organizational structure through which the Institute will be managed. The roles of the director, key administrators, and research team leaders will be identified. The personnel organizational structure must be identified, including the anticipated total number and distribution of research and administrative personnel. Only those students, researchers, faculty, administrators, adjunct faculty, affiliates, consultants, and advisors associated with the host university may receive funding from the UARC. A plan to attract, appraise, and retain researchers over the duration of the Institute should be presented. A

financial management plan must also be specified which indicates how monetary resources will be redistributed among researchers, administrators, and subcontractors in response to changing research results and opportunities. The Management Plan will indicate how the Institute will report within the university system. Prior UARCs report directly to the provost of the university as a separate entity within the university organization. The university's vision of how the Institute will be created, manned, managed, and supported must be clearly specified. The role of the Institute in the university's strategic plan and long-range vision should be identified. Since the Institute will be a highly visible activity within the university community, attracting significant governmental and industrial interactions, the plan should indicate the role the university will play in supporting the Institute's activities coordinating with industrial sources in order to promote the total effort toward attaining the Army mission. The plan must also show how the university will connect with and leverage innovative research efforts involving parties external to the university, including small and small disadvantaged business.

3.2.3. UARC Research Management Plan

The Management Plan must specify how the Institute, in coordination with the Army, will choose which research projects to pursue. It is anticipated that each research project will be reviewed and renewed annually. Individual Action Plans (IAP) should be drawn up at the start of projects to reflect protocols that will guide the tasks. Progress in relation to these action plans and corresponding time lines are to be reported and evaluated at regular project performance reviews. The Management Plan should indicate how research and development tasks will be defined from within the various technical disciplines in cooperation with selected representatives of the at-large scientific community, industry, and the Army. The Management Plan must indicate how the quality of the research will be maintained. The means by which research projects and personnel are added to or removed from the Institute's portfolio should be clearly identified. A plan for annual external program reviews and periodic internal performance appraisals must be specified. The external program reviews will allow the Army to assess the progress and relevance of the research program and will be attended by the ARO program manager, principal Army collaborators, other government officials, and representatives of each industrial partner. The management plan must outline the nature and scope of the offeror's approach for the external program review. The internal reviews may take place through an internal oversight committee or other means as deemed appropriate by the university.

It is possible that no single university has the internal expertise to adequately fulfill the Army's expectations for the ICB in its entirety. An individual university offeror may choose as the lead university to enlist through subcontract the complementary research expertise of up to two other universities, and that lead university will be designated as the UARC host for the Institute. The offeror may propose up to 40% of the Army ICB funded amount to be subcontracted for that purpose. Within that 40% ceiling, the lead university may propose use of up to 10% of the total ICB funding for additional expertise that may include various consultants and advisors from other sources, including personnel from other universities and not-for-profit organizations.

There is no requirement for the university to subcontract, and an offeror will not be penalized for not proposing to subcontract. Conversely, a university will be penalized if it depends too strongly on subcontractors, and a proposal will be considered non-responsive if the UARC budget proposes more than 40% of the Army funded amount for subcontracting. All subcontracted activities and

partnerships will be dynamic in nature and subject to the reviews and controls in the management plan. These controls must emphasize both reasonableness and realism of costs proposed.

3.2.4. Technology Transition Management Plan

Offerors must submit a Technology Transition Plan as part of their Management Proposal. It is anticipated that the planned approximately $40 million 5-year award provided to the UARC will result in a panoply of innovations in cross-disciplinary bioengineering sciences and biotechnology.. It will be essential to exchange scientific and technical information between the UARC and all relevant university, industrial, and governmental research activities, especially Army-funded ones, that will arise over the life of the Institute. The following represents the basic requirements of the Technology Transition Plan, which will likely be incorporated into any resulting contract as the guide for technology transition efforts engaged in by the UARC with the Army, industry, academia, and government entities. Use of collaborative tools enabling strong research and technology transition team networking is encouraged.

3.2.4.1. Interface with the Army

The objective of any interface with the Army is to ensure the relevance of the research and to rapidly transition innovations derived from UARC research. The Technology Transition Management Plan must address the efforts the UARC will take to implement transition opportunities with the Army and the mechanisms it will use to transfer the technology to the Army. It is expected that the Technology Transition Management Plan will clearly explain how Institute personnel will directly coordinate research with the Army on a continuing basis. Army participation is considered crucial to the success of this center. University planning should be explicit in its description of a personnel exchange program wherein qualified visiting Army scientists or engineers could work closely with university investigators. To provide the Institute technical guidance and assistance in assessing the Army relevance of proposed research, the Army anticipates designating technical advisors from relevant Army laboratories and research centers. The plan will specify the administrative and personnel commitment to enable a thriving technology transition between the Army and the UARC.

3.2.4.2. Interface with Other University and Government Sponsored Research Centers

It is essential that the UARC research program interact with other Army or DoD sponsored research efforts located at universities or at government laboratories where applicable. This includes, for example, ARO-sponsored single investigators, the DoD Multidisciplinary University Research Initiative (http://www.defenselink.mil/news/Mar2002/b03202002_bt135-02.html) or (http://www.onr.navy.mil/02/baa/02_025.htm), the National Nanotechnology Initiative (http://www.nano.gov/), the Institute for Soldier Nanotechnolgies (http://web.mit.edu/isn/) and the Institute for Creative Technologies (http://www.ict.usc.edu/), the Army Research Laboratory's Collaborative Technology Alliances (http://www.arl.army.mil/alliances/index.html), and investigators supported through the extramural programs of the Army Medical Research and Materiel Command. The plan must provide a general approach for interacting with projects that are performing research in areas similar to or related to the UARC research plan. It must specify how it will both import and export technology breakthroughs between itself and the other research centers.

3.2.4.3. Interface with Industry

The immediate objective of any interface with industry is to transition innovations derived from UARC research to industrial concerns with the capability to provide demonstrations of producibility. The ultimate objective is to incorporate these innovations into products to be used by future Army programs. The proposal must detail industrial partners and the nature of the planned interaction. Documentation of the extent of commitment will be evaluated.

3.2.4.4. Process for Handling Intellectual Property Issues

Questions regarding intellectual property rights in technical data, computer software, copyrights, and patents, and the protection of those rights, will arise in pursuing the Technology Transition Plan. The Plan must therefore address how the UARC proposes to handle such issues with the various entities with which it interfaces: industry, academia and government. Since the specifics of any technological transfer or collaboration is not yet known, it is sufficient to explain what issues would be considered and the mechanism for resolving disputes and protecting sensitive information.

3.3. University Commitment and Cost Volume

The University Commitment and Costs Volume will address all of the elements outlined below. The budget submission should address only the approximately $40,000,000 of Army funding along with any additional amounts of cost sharing offered. The discussion of commitment may include information relative to industrial commitment for transitioning to producible technologies, but in view of the uncertainty of specifics, estimating costs for subsequent task orders is not worthwhile.

3.3.1.1. Institute Facilities and Infrastructure

The university commitment must include provision of appropriate facilities for the Institute. Facilities and infrastructure wherein ICB-affiliated personnel are conveyed primacy for team co-location and use within the lead (host) university must be defined. The proposal may contain requests for funds to purchase collaborative tools for research teams to network for purposes of full integration of partner activities with lead university activities for accomplishment of Institute objectives. It is expected that such facilities and infrastructure would be available for ICB use within six months of award date. A signed statement of this commitment must be obtained from the appropriate State, institutional, and/or university officials. The proposal shall be considered non-responsive if such a commitment is not clearly delineated in the University Commitment and Cost Volume. A description of the facility must be included and must be of sufficient detail to judge the appropriateness of the facility to house the Institute. This facility shall be in addition to any other cost sharing or co-investment plans that are proposed. All other university commitments to provide infrastructure for the ICB should also be detailed in the proposal.

3.3.1.2. Co-Investment and Contributions

The University Commitment and Costs Volume shall clearly present the level and nature of contributions or co-investment offered. The presentation must indicate the source, nature,

timing, and amount of contributions as well as documenting the binding commitment to provide the co-investment.

3.3.1.3. Estimated Costs

The financial portion of the proposal should contain cost estimates sufficiently detailed for meaningful evaluation of the proposals. Offerors shall use ARO Form 99, Summary Proposal Budget obtainable at http://www.aro.army.mil/forms/forms2.htm#fm baa, to submit budget data. The total basic research costs will be evaluated for cost realism and reasonableness within funding constraints. For budget purposes, offerors shall use an award start date of 1 September 2003 and a program duration of five years. The budget must include annual breakdowns along with a total five year program budget. The budget must include the total cost of the project, as well as a breakdown of the amount by sources of funding (e.g., funds requested from the DoD agency and non-federal funds to be provided). The offerors must present costs separately for management and for each distinct research task. Proposed acquisition of research equipment and instrumentation should be consolidated into a separate infrastructure cost estimate, together with plans for execution of purchase within the first six months of award.

3.3.1.4. Subcontracting Plan

Offerors shall submit with their proposal a Subcontracting Plan. The Subcontracting Plan is to include provisions for subcontracting with any university partners chosen by the lead university for inclusion within the proposal as a contributor of expertise complementary to that of the lead university. The plan shall conform to the requirements of FAR 19.704 and DFARS Subpart 226.70. The proposed plan and goals will be negotiated with all offerors determined to be within the competitive range. At the time of award, the plan will be incorporated into and made a material part of the contract. The successful offeror's Subcontracting Plan that must be approved by the contracting officer prior to award of the resulting contract. Compliance with that plan will be monitored during performance.

4. Eligibility

Proposals may be submitted only by degree-granting universities located within the United States. An individual university offeror may choose as the lead university to enlist through subcontract the complemetary expertise of up to two other universities, and that lead university will be designated as the UARC host for the Institute. The university is encouraged to interact with and involve Federal laboratories, Federally Funded Research and Development Centers, and academic institutions that are federal government organizations (e.g., Naval Postgraduate School), but these entities may not submit proposals and may not receive funds awarded through this competition.

5. Instructions to Offerors

The selection process will be conducted on the basis of competitive peer review to insure that any resulting award is made with the greatest confidence that the selected host university offeror best meets the objectives of this UARC.

5.1. Proposal Format Information

The proposal shall be provided in three separate volumes, each bound separately in a manner suitable to facilitate handling and distribution. Each volume should be concise, utilizing one side of each page with no foldout pages. Specific page limitations are described below. Each proposal must be typed or printed (with type that is not smaller than 12 point on standard 8 1/2" x 11" paper with one (1) inch margins, 6 lines per inch). In addition, each of these volumes shall contain a table of contents that is included within the page limitations and recommended formats set forth below.

5.1.1. Research Program Volume

The pages included in the Research Program Volume shall be numbered. Offerors are advised that the Research Program Volume of the proposal shall not exceed 25 pages (including figures), plus a one-page vita per investigator. Offerors are cautioned that pages in excess of the 25-page limitation, and pages in excess of the 1 page limitation for the vitae, will not be included in the evaluation. Inclusion of research manuscripts and reprints is strongly discouraged and will be counted against the 25-page limit. The layout of the Research Program Volume is recommended as follows:

A. Table of Contents
B. Executive Summary
C. Research Plan
    1. Sensors, Electronics and Photonics
    2. Soldier Health and Performance
    3. Technical Foundations
D. Outreach Plan
    1. Outreach to the Army
    2. Outreach to other Sponsored Research Activities
    3. Industrial Partners
    4. Outreach to Expand Base of Customers and Partners
    5. Education and Relevance
E. Brief (maximum 1 page) vitae for each investigator

5.2.2. Program Management Volume

The pages included in the Program Management Volume shall be numbered. Offerors are advised that the Program Management Volume of the proposal shall not exceed 20 pages (including figures), plus a one-page vitae for the Institute Director and each of the senior management staff. Offerors are cautioned that pages in excess of the 20-page limitation, and pages in excess of the 1 page limitation for the vitae, will not be included in the evaluation. The 20-page maximum does not include the Security Compliance Plan (if necessary). The layout of the Program Management Volume is recommended as follows:

A. Table of Contents
B. Executive Summary
C. Program Management Plan
    1. Internal UARC Organizational Structure and Plan
    2. UARC Research Management Plan
    3. Technology Transition Management Plan

5.2.3. University Commitment and Cost Volume

There is no page limit for the University Commitment and Cost Volume. The layout of the University Commitment and Cost Volume is recommended as follows:

A. Table of Contents
B. Executive Summary
C. Facilities and Infrastructure
D. Contributions and Co-Investment
E. Estimated Costs
F. Sub-Contracting Plan

5.2. Marking of Proposals

The proposal submitted in response to this solicitation may contain technical and other data that the offeror does not want disclosed to the public or used by the Government for any purpose other than proposal evaluation. Information contained in unsuccessful proposals will remain the property of the offeror except for that evidenced in the Proposal Cover Page and Project Summary. The Government may, however, retain copies of all proposals. Public release of information in any proposal submitted will be subject to existing statutory and regulatory requirements. If proprietary information which constitutes a trade secret, proprietary commercial or financial information, confidential personal information, or data affecting the national security, is provided by a offeror in a proposal, it will be treated in confidence, to the extent permitted by law, provided that the following legend appears and is completed on the front of the proposal: "For any purpose other than to evaluate the proposal, this data shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part, provided that if an award is made to the offeror as a result of or in connection with the submission of this data, the Government shall have the right to duplicate, use or disclose the data to the extent provided in the agreement. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained in page(s) _____ of this proposal." Any other legend may be unacceptable to the Government and may constitute grounds for removing the proposal from further consideration without assuming any liability for inadvertent disclosure. The Government will limit dissemination of properly marked information to within official channels. In addition, the pages indicated as restricted must be marked with the following legend: "Use or disclosure of the proposal data on lines specifically identified by asterisk (*) are subject to the restriction on the front page of this proposal." The Government assumes no liability for disclosure or use of unmarked data and may use or disclose such data for any purpose. In the event that properly marked data contained in a proposal submitted in response to this solicitation is requested pursuant to the Freedom of Information Act, 5 USC 552, the offeror will be advised of such request and, prior to such release of information, will be requested to expeditiously submit to ARO a detailed listing of all information in the proposal which the offeror believes to be exempt from disclosure under the Act. Such action and cooperation on the part of the offeror will ensure that any information released by ARO pursuant to the Act is properly determined.

5.3. Proposal Submission Information

Proposals must be submitted according to the instructions contained herein. Proposals shall be submitted in response to an Army request for submission based on successful technical peer review of previously submitted white paper. A Proposal Cover Sheet (ARO Form 51) shall be submitted with the proposal and shall include a single sheet attachment identified as "Proposal Partnerships". Proposal partnerships are all cooperative partnerships with industry, consultants and advisors, including personnel from other universities or other not-for-profit organizations. **Proposals in connection with this Solicitation are due by 4:00pm ET on May 1, 2003.** A proposal shall consist of the following:

PROPOSAL ITEM/VOLUME	NUMBER OF COPIES
Proposal Cover Sheet (ARO Form 51) with Authorized Signature(s) and Proposal Partnership Attachment	Original and **1** copy
Research Program Summary (A brief, 1-2 page abstract that summarizes the content of the Research Program of the proposal.)	Original and **10** copies
Research Program Volume (to include Biographical Sketches)	Original and **10** copies
Program Management Volume(to include Biographical Sketches)	Original and **10** copies
University Commitment and Cost Volume	Original and **10** copies
Certifications (Section 8, Pages 29 – 42 of the BAA)	Original only

NOTE: There will be NO electronic submission of proposals in connection with this Broad Agency Announcement.

Proposals must be submitted directly to the following address:

For USPS
U.S. Army Robert Morris Acquisition Center
Research Triangle Park Division
ATTN: AMSSB-ACC-R (Diane Hodor)
P.O. Box 12211
Research Triangle Park, NC 27709-2211

For FedEx, UPS etc.
U.S. Army Robert Morris Acquisition Center
Research Triangle Park Division
ATTN: AMSSB-ACR (Diane Hodor)
4300 S. Miami Blvd.
Durham, NC 27703-9142

5.4. Submissions, Modifications and Withdrawals of Proposals

(a) Offerors are responsible for submitting proposals, and any revisions, and modifications, so

as to reach the Government office designated in the solicitation by the time specified in the solicitation. Offerors may use any transmission method authorized by the solicitation (i.e., regular mail, electronic commerce, or facsimile). If no time is specified in the solicitation, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that proposals are due. (b) (1) Any proposal, modification, or revision, that is received at the designated Government office after the exact time specified for receipt of proposals is "late" and will not be considered unless it is received before award is made, the contracting officer determines that accepting the late proposal would not unduly delay the acquisition; and (i) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of proposals; or (ii) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of proposals and was under the Government's control prior to the time set for receipt of proposals; or (iii) It was the only proposal received. (2) However, a late modification of an otherwise successful proposal, that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted. (c) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel. (d) If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the Government office designated for receipt of proposals by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation closing date, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume. (e) Proposals may be withdrawn by written notice at any time before award. (f) The contracting officer must promptly notify any offeror if its proposal, modification, or revision was received late, and must inform the offeror whether its proposal will be considered, unless contract award is imminent and the notice of award would suffice. (g) Late proposals and modifications that are not considered must be held unopened, unless opened for identification, until after award and then retained with other unsuccessful proposals.

5.5. Military Recruiting on Campus

This is to notify potential offerors that the contract awarded under this announcement to an institution of higher education shall include the clause: Defense Federal Acquisition Regulation Supplement (DFARS) 252.209-7005, Military Recruiting on Campus.

5.6. CCR Registration

In accordance with DOD policy, prospective contractors must be registered in the Department of Defense (DOD) CENTRAL CONTRACTOR REGISTRATION (CCR) DATABASE prior to award of a contract, basic agreement, basic ordering agreement, or blanket purchase agreement. By submission of an offer resulting from this Broad Agency Announcement (BAA), the offeror acknowledges the requirement that a prospective contractor must be registered in the CCR database prior to award, during performance, and through final payment of any contract resulting from this BAA.

5.7. Service of Protest

(a) Protests, as defined in section 33.01 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from Robert Morris Acquisition Center, 4300 South Miami Blvd., Durham, NC 27703-9142. (b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO

5.8. Use of Human Subjects And Laboratory Animals

Awardees under this BAA must comply with applicable provisions of national policies concerning research involving the use of live organisms.

5.8.1. Human Subjects

For human subjects, the provisions include the Common Federal Policy for the Protection of Human Subjects codified by the Department of Health and Human Services at 45 CFR part 46 and implemented by the Department of Defense at 32 CFR part 219.

5.8.2. Animals

For animals, the provisions include rules on animal acquisition, transport, care, handling, and use in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Laboratory Animal Welfare Action of 1966 (U.S.C. 2131-2156); and (ii) the "Guide for the Care and Use of Laboratory Animals," National Institutes of Health Publication No. 86-23.

5.9 Reports

The number and types of reports will be specified in the award document. The reports shall be prepared and submitted in accordance with the procedures contained in the award document and mutually agreed on before award. A Final Report that summarizes the project and tasks is required at the conclusion of the performance period.

6. Evaluation Criteria and Selection Process

6.1. Introduction

Evaluation of proposals will be conducted by a technical peer review. The Government reserves the right to appoint evaluators that are not government employees. All evaluators will be required to sign a certificate concerning Conflicts of Interest, Nondisclosure and Rules of Conduct.

The proposal selection process will be conducted based upon a technical peer review as described in Federal Acquisition Regulation Subparts 6.102(d)(2) and 35.016. All information necessary for the review and evaluation of a proposal must be contained in the Research Program, Program Management, and the University Commitment and Cost Volumes. No other materials will be provided to the evaluators. The award will be based on an integrated assessment of each offeror's ability to

satisfy this announcement's requirements. The Government anticipates discussions with offerors will be conducted; however, the Government reserves the right to make an award without discussions. A competitive range may be established for discussions. If discussions are held, offerors in the competitive range will be invited to submit Final Proposal Revisions, which will be evaluated using the same evaluation procedures as were used with the initial proposals. The Army, at its discretion, may visit proposed sites during the proposal evaluation phase to verify information contained in the proposals. Any site visits will be coordinated with the offerors. Where applicable, it is anticipated that site visits would be scheduled for mid-late June 2003. An award will not be made if, in the opinion of the Contracting Officer, it is not in the Government's best interest. In such a case, the program may be re-competed at a later time. This solicitation is subject to the availability of funds.

6.2. Relative Importance of Factors and Subfactors

The Research Program Volume is significantly more important than the Program Management Volume. The Program Management Volume is significantly more important than University Commitment and Cost Volume. Cost will be evaluated for realism and reasonableness only and will not be weighted.

Within the Research Program the three research areas (Sensors, Electronics and Photonics; Soldier Health and Performance; Technical Foundations) and the Outreach Plan are each of equal importance. Within the Program Management Plan the Internal UARC Organizational Structure and Plan, the UARC Research Management Plan, and the Technology Transition Management Plan are each of equal importance.

Within the Cost Volume the evaluation criteria for University Commitment (the adequacy and appropriateness of the proposed prime user facility and the extent of university and/or industrial commitment, either monetary or in-kind) are of equal importance.

6.3. Evaluation of the Research Program

6.3.1. Research Plan (Criteria 1-3)

The Research Plan evaluation will be based primarily on the following two criteria, of equal importance:

1. Scientific and technical merits of the proposed research; and
2. Potential contribution of the research to bioengineering sciences and biotechnology and the Army's future mission.

Another evaluation criterion, of lesser importance, is:

3. Experience and qualifications of the principal investigator, other key research personnel, (including on-site industry researchers) and the institution sponsoring the proposal.

6.3.2. Outreach Plan (Criterion 4)

The Outreach Plan evaluation will be based on one combined outreach criterion, encompassing equally weighted consideration of the five following sub-criterion factors:

1. Outreach to the Army

2. Outreach to other Sponsored Research Activities
3. Industrial Partners
4. Outreach to Expand Base of Customers and Partners, and
5. Education and Relevance

The evaluation team will examine each of the individual categories to determine if the proposed plan meets the objectives of this solicitation.

6.4. Evaluation of Program Management

6.4.1. Internal UARC Organizational Structure and Plan (Criterion 5)

The Internal UARC Organizational Structure and Plan evaluation will be based on one criterion for Organizational Structure and Plan, encompassing two sub-criterion factors of equal importance:

1. Qualifications of key management personnel to include their qualifications, capabilities, availability, and the experience of the offeror's research and management personnel individually and as a whole, their relevant past accomplishments, and their demonstrated ability to achieve the proposed technical objectives.
2. The adequacy of the proposed administration/management support infrastructure to accomplish the objectives of the management and research plans, including the amount of administrative and management support provided by the host university and the visibility of the ISB within the university structure.

6.4.2. UARC Research Management Plan (Criterion 6)

The UARC Research Management Plan evaluation will be evaluated on the basis of one Research Management criterion encompassing three sub-criterion factors of equal importance:

1. Adequacy of the plans for defining, approving and modifying research tasks including the procedures for strategizing the development of tasks within the various technical disciplines and the manner in which representatives of the scientific community at large and the government researchers are utilized in planning and approving research objectives.
2. Adequacy of performance review procedures with emphasis on targeting outcomes at all project stages to guide continuous process improvement and measure effectiveness and quality through the use of internal and external reviews.
3. Adequacy of plans for linking work conducted at the ISB with commercial sources and connecting with and leveraging innovative research efforts involving parties external to the university to include small, small disadvantaged, and small women owned businesses.

6.4.3. Technology Transition Management Plan (Criterion 7)

The Technology Transition Management Plan will be evaluated on the basis of one criterion addressing adequacy and completeness of the plan in the following four categories of sub-criterion evaluation factors, each of equal importance:

1. Interface with the Army
2. Interface with other University and Government Research Centers

3. Interface with Industry
4. Intellectual Property Issues

The evaluation team will examine each of the individual categories to determine if the proposed plan meets the objectives of this solicitation.

6.5. Evaluation of University Commitment and Cost (Criterion 8)

The University Commitment and Cost evaluation will be based on one criterion encompassing the following sub-criterion evaluation factors, which are of equal importance:

1. The adequacy and appropriateness of the proposed primary user facility.
2. The extent of university and /or industrial commitment, either monetary or in-kind.

The cost proposal will be evaluated for cost realism and reasonableness. The following Cost criteria are not weighted factors.

3. The realism and reasonableness of the proposed budget in light of the research proposed.
4. The adequacy of the sub-contracting plan.

7. Contract Clauses Award Document Information

The intended award document will follow the Uniform Contract Format and will be issued on a Standard Form 26. A model of Part II – Contract Clauses, Section I, is made available for your information at the following web site: http://www.arl.army.mil/aro/xxx. The contract will incorporate clauses in full text and by reference, the full text of a clause may be electronically accessed for FAR clauses: http://farsite.hill.af.mil/vffara.htm and DFAR clauses at: http://farsite.hill.af.mil/VFDFARA.HTM.

8. Representations, Certifications and Other Statements of Offerors or Respondents

FAR 52.252 – Solicitation Provisions Incorporated by Reference (Feb 1998).

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at this/these address(es): http://farsite.hill.af.mil/vffara.htm and DFAR clauses at: http://farsite.hill.af.mil/VFDFARA.HTM.

(End of Provision)

FAR 52.203-11 Certification And Disclosure Regarding Payments To Influence Certain Federal Transactions (Apr 1991) (Deviation).

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The Offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989, --

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of congress, an officer or employee of Congress, or any employee of a Member of Congress on his or her behalf in connection with this solicitation, the Offeror shall complete and submit, with its offer, OMB Standard Form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(End of Provision)

FAR 52.204-5 Women-Owned Business (Other Than Small Business) (May 1999).

(a) *Definition*. "Women-owned business concern," as used in this provision, means a concern that is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of its stock is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

(b) *Representation*. *[Complete only if the Offeror is a women-owned business concern and has not represented itself as a small business concern in paragraph (b)(1) of FAR 52.219-1, Small Business Program Representations, of this solicitation.]* The Offeror represents that it ☐ is a women-owned business concern.

(End Of Provision)

FAR 52.204-6 -- Data Universal Numbering System (DUNS) Number (Jun 1999)

(a) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation "DUNS" followed by the DUNS number that identifies the offeror's name and

address exactly as stated in the offer. The DUNS number is a nine-digit number assigned by Dun and Bradstreet Information Services.

(b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:

(1) Company name.
(2) Company address.
(3) Company telephone number.
(4) Line of business.
(5) Chief executive officer/key manager.
(6) Date the company was started.
(7) Number of people employed by the company.
(8) Company affiliation.

(c) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet home page at http://www.customerservice@dnb.com/. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at globalinfo@mail.dnb.com.

(End of Provision)

FAR 52.209-5 -- Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters (Dec 2001)

(a)

(1) The Offeror certifies, to the best of its knowledge and belief, that --

(i) The Offeror and/or any of its Principals --

(A) Are * are not * presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have * have not *, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are * are not * presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has * has not *, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) *"Principals,"* for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

This Certification Concerns a Matter Within the Jurisdiction of an Agency of the United States and the Making of a False, Fictitious, or Fraudulent Certification May Render the Maker Subject to Prosecution Under Section 1001, Title 18, United States Code.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.
(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of Provision)

FAR 52.215-6 Place of Performance (Oct 1997).

(a) The Offeror or respondent, in the performance of any contract resulting from this solicitation, ☐ intends, ☐ does not intend *[check applicable block]* to use one or more plants or facilities located at a different address from the address of the Offeror or respondent as indicated in this proposal or response to request for information.
(b) If the Offeror or respondent checks "intends" in paragraph (a) of this provision, it shall insert in the following spaces the required information:

PLACE OF PERFORMANCE (STREET ADDRESS, CITY, STATE, COUNTY, ZIP CODE)	NAME AND ADDRESS OF OWNER AND OPERATOR OF THE PLANT OR FACILITY IF OTHER THAN OFFEROR OR RESPONDENT

(End of Provision)

FAR 52.215-7 Annual Representations And Certifications --Negotiation (Oct 1997).
(Applicable only if 52.215-7 is included in the solicitation.)

The Offeror has [check the appropriate block]:

(a) ☐ Submitted to the contracting office issuing this solicitation, annual representations and certifications dated *[insert date of signature on submission]* that are incorporated herein by reference, and are current, accurate, and complete as of the date of this proposal, except as follows *[insert changes that affect only this proposal; if "none", so state]*: .

(b) ☐ Enclosed its annual representations and certifications.

(End of Provision)

FAR 52.219-1 -- Small Business Program Representations (May 2001)

(a)

(1) The North American Industry Classification System (NAICS) code for this acquisition is _____ [*insert NAICS code*].

(2) The small business size standard is _____ *[insert size standard]*.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) *Representations*.

(1) The offeror represents as part of its offer that it * is, * is not a small business concern.

(2) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents, for general statistical purposes, that it {time} is, {time} is not, a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it * is, * is not a women-owned small business concern.

(4) [Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.] The offeror represents as part of its offer that it [ ] is, [ ] is not a veteran-owned small business concern.

(5) [Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(4) of this provision.] The offeror represents as part of its offer that it [ ] is, [ ] is not a service-disabled veteran-owned small business concern.

(c) *Definitions.* As used in this provision --

Service-disabled veteran-owned small business concern --

(1) Means a small business concern --

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C.101(2), with a disability that is service-connected, as defined in 38 U.S.C.101(16).

"Small business concern," means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

Veteran-owned small business concern means a small business concern --

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C.101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern," means a small business concern --

(1) That is at least 51 percent owned by one or more women; or, in the case of any publicly owned business, at least 51 percent of the stock of that is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) *Notice*.

(1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C.645(d), any person who misrepresents a firm's status as a small, HUBZone small, small disadvantaged, or women-owned small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall --

(i) Be punished by imposition of fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

(End of Provision)

FAR 52.219-22 Small Disadvantaged Business Status (Oct 1999)

(a) *General*. This provision is used to assess an offeror's small disadvantaged business status for the purpose of obtaining a benefit on this solicitation. Status as a small business and status as a small disadvantaged business for general statistical purposes is covered by the provision at FAR 52.219-1, Small Business Program Representation.

(b) *Representations*.

(1) General. The Offeror represents, as part of its offer, that it is a small business under the size standard applicable to this acquisition; and either--

(i) ☐ It has received certification by the Small Business Administration as a small disadvantaged business concern consistent with 13 CFR 124, Subpart B; and

(A) No material change in disadvantaged ownership and control has occurred since its certification;

(B) Where the concern is owned by one or more disadvantaged individuals, the net worth of each individual upon whom the certification is based does not exceed $750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); and

(C) It is identified, on the date of its representation, as a certified small disadvantaged business concern in the database maintained by the Small Business Administration (PRO-Net); or

(ii) ☐ It has submitted a completed application to the Small Business Administration or a Private Certifier to be certified as a small disadvantaged business concern in accordance with 13 CFR 124, Subpart B, and a decision on that application is pending,

and that no material change in disadvantaged ownership and control has occurred since its application was submitted.

(2) ☐ *For Joint Ventures.* The Offeror represents, as part of its offer, that it is a joint venture that complies with the requirements at 13 CFR 124.1002(f) and that the representation in paragraph (b)(1) of this provision is accurate for the small disadvantaged business concern that is participating in the joint venture. *[The Offeror shall enter the name of the small disadvantaged business concern that is participating in the joint venture: _____.]*

(c) *Penalties and Remedies.* Anyone who misrepresents any aspects of the disadvantaged status of a concern for the purposes of securing a contract or subcontract shall--

(1) Be punished by imposition of a fine, imprisonment, or both;

(2) Be subject to administrative remedies, including suspension and debarment; and

(3) Be ineligible for participation in programs conducted under the authority of the Small Business Act.

(End Of Provision)

FAR 52.222-22 Previous Contracts And Compliance Reports (Feb 1999)

The Offeror Represents That--

(a) It ☐ has, ☐ has not participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation;

(b) It ☐ has, ☐ has not filed all required compliance reports; and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End Of Provision)

FAR 52.222-25 Affirmative Action Compliance (Apr 1984).

The Offeror represents that--

(a) It ☐ has developed and has on file, ☐ has not developed and does not have on file, at each establishment, affirmative action programs required by the rules and regulations of the Secretary of Labor (41 CFR 60-1 and 60-2), or

(b) It ☐ has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

(End of Provision)

FAR 52.223-13 -- Certification of Toxic Chemical Release Reporting (Oct 2000)

(a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995.

(b) By signing this offer, the offeror certifies that --

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C.11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C.13106), the offeror will file and continue to file for such facilities for the life of the

contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: *[Check each block that is applicable.]*

____* (i) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C.11023(c);

____* (ii) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C.11023(b)(1)(A);

____* (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C.11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

____* (iv) The facility does not fall within Standard Industrial Classification Code (SIC) major groups 20 through 39 or their corresponding North American Industry Classification System (NAICS) sectors 31 through 33; or

____* (v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(End of Provision)

FAR 52.226-2 -- Historically Black College or University and Minority Institution Representation (May 2001)

(a) *Definitions.* As used in this provision --

Historically black college or university means an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2. For the Department of Defense, the National Aeronautics and Space Administration, and the Coast Guard, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

Minority institution means an institution of higher education meeting the requirements of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C.1067k, including a Hispanic-serving institution of higher education, as defined in Section 316(b)(1) of the Act (20 U.S.C.1101a)).

(b) *Representation.* The offeror represents that it --

[ ] is [ ] is not a historically black college or university;

[ ] is [ ] is not a minority institution.

(End of Provision)

FAR 52.227-6 -- Royalty Information (Apr 1984)

(a) *Cost or charges for royalties.* When the response to this solicitation contains costs or charges for royalties totaling more than $250, the following information shall be included in the response relating to each separate item of royalty or license fee:

(1) Name and address of licensor.

(2) Date of license agreement.
(3) Patent numbers, patent application serial numbers, or other basis on which the royalty is payable.
(4) Brief description, including any part or model numbers of each contract item or component on which the royalty is payable.
(5) Percentage or dollar rate of royalty per unit.
(6) Unit price of contract item.
(7) Number of units.
(8) Total dollar amount of royalties.

(b) *Copies of current licenses.* In addition, if specifically requested by the Contracting Officer before execution of the contract, the offeror shall furnish a copy of the current license agreement and an identification of applicable claims of specific patents.

(End of Provision)

FAR 52.230-1 -- Cost Accounting Standards Notices and Certification (Jun 2000)

Note: This notice does not apply to small businesses or foreign governments. This notice is in three parts, identified by Roman numerals I through III.

Offerors shall examine each part and provide the requested information in order to determine Cost Accounting Standards (CAS) requirements applicable to any resultant contract.

If the offeror is an educational institution, Part II does not apply unless the contemplated contract will be subject to full or modified CAS coverage pursuant to 48 CFR 9903.201-2(c)(5) or 9903.201-2(c)(6), respectively.

I *Disclosure Statement* -- Cost Accounting Practices and Certification

(a) Any contract in excess of $500,000 resulting from this solicitation will be subject to the requirements of the Cost Accounting Standards Board (48 CFR Chapter 99), except for those contracts which are exempt as specified in 48 CFR 9903.201-1.
(b) Any offeror submitting a proposal which, if accepted, will result in a contract subject to the requirements of 48 CFR Chapter 99 must, as a condition of contracting, submit a Disclosure Statement as required by 48 CFR 9903.202. When required, the Disclosure Statement must be submitted as a part of the offeror's proposal under this solicitation unless the offeror has already submitted a Disclosure Statement disclosing the practices used in connection with the pricing of this proposal. If an applicable Disclosure Statement has already been submitted, the offeror may satisfy the requirement for submission by providing the information requested in paragraph (c) of Part I of this provision.

Caution: In the absence of specific regulations or agreement, a practice disclosed in a Disclosure Statement shall not, by virtue of such disclosure, be deemed to be a proper, approved, or agreed-to practice for pricing proposals or accumulating and reporting contract performance cost data.
(c) *Check the appropriate box below:*

* (1) *Certificate of Concurrent Submission of Disclosure Statement.* The offeror hereby certifies that, as a part of the offer, copies of the Disclosure Statement have been submitted as follows:

(i) Original and one copy to the cognizant Administrative Contracting Officer (ACO) or cognizant Federal agency official authorized to act in that capacity (Federal official), as applicable; and
(ii) One copy to the cognizant Federal auditor.
(Disclosure must be on Form No. CASB DS-1 or CASB DS-2, as applicable. Forms may be obtained from the cognizant ACO or Federal official and/or from the loose-leaf version of the Federal Acquisition Regulation.)

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement.

* (2) *Certificate of Previously Submitted Disclosure Statement.* The offeror hereby certifies that the required Disclosure Statement was filed as follows:

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the applicable Disclosure Statement.

*(3) *Certificate of Monetary Exemption.* The offeror hereby certifies that the offeror, together with all divisions, subsidiaries, and affiliates under common control, did not receive net awards of negotiated prime contracts and subcontracts subject to CAS totaling more than $50 million or more in the cost accounting period immediately preceding the period in which this proposal was submitted. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

* (4) *Certificate of Interim Exemption.* The offeror hereby certifies that
(i) the offeror first exceeded the monetary exemption for disclosure, as defined in (3) of this subsection, in the cost accounting period immediately preceding the period in which this offer was submitted and

(ii) in accordance with 48 CFR 9903.202-1, the offeror is not yet required to submit a Disclosure Statement. The offeror further certifies that if an award resulting from this proposal has not been made within 90 days after the end of that period, the offeror will immediately submit a revised certificate to the Contracting Officer, in the form specified under subparagraph (c)(1) or (c)(2) of Part I of this provision, as appropriate, to verify submission of a completed Disclosure Statement.

Caution: Offerors currently required to disclose because they were awarded a CAS-covered prime contract or subcontract of $50 million or more in the current cost accounting period may not claim this exemption (4). Further, the exemption applies only in connection with proposals submitted before expiration of the 90-day period following the cost accounting period in which the monetary exemption was exceeded.

II. Cost Accounting Standards -- Eligibility for Modified Contract Coverage {time} The offeror hereby claims an exemption from the Cost Accounting Standards clause under the provisions of 48

CFR 9903.201-2(b) and certifies that the offeror is eligible for use of the Disclosure and Consistency of Cost Accounting Practices clause because during the cost accounting period immediately preceding the period in which this proposal was submitted, the offeror received less than $50 million in awards of CAS-covered prime contracts and subcontracts. Checking the box below shall mean that the resultant contract is subject to the Disclosure and Consistency of Cost Accounting Practices clause in lieu of the Cost Accounting Standards clause.

* The offeror hereby claims an exemption from the Cost Accounting Standards clause under the provisions of 48 CFR 9903.201-2(b) and certifies that the offeror is eligible for use of the Disclosure and Consistency of Cost Accounting Practices clause because during the cost accounting period immediately preceding the period in which this proposal was submitted, the offeror received less than $25 million in awards of CAS-covered prime contracts and subcontracts, or the offeror did not receive a single CAS-covered award exceeding $1 million. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.
Caution: An offeror may not claim the above eligibility for modified contract coverage if this proposal is expected to result in the award of a CAS-covered contract of $50 million or more or if, during its current cost accounting period, the offeror has been awarded a single CAS-covered prime contract or subcontract of $50 million or more.

III. Additional Cost Accounting Standards Applicable to Existing Contracts

The offeror shall indicate below whether award of the contemplated contract would, in accordance with subparagraph (a)(3) of the Cost Accounting Standards clause, require a change in established cost accounting practices affecting existing contracts and subcontracts.

Yes	No

(End of Provision)

Alternate I (Apr 1996). As prescribed in 30.201-3(b), add the following subparagraph (c)(5) to Part I of the basic provision:

* (5) Certificate of Disclosure Statement Due Date by Educational Institution. If the offeror is an educational institution that, under the transition provisions of 48 CFR 9903.202-1(f), is or will be required to submit a Disclosure Statement after receipt of this award, the offeror hereby certifies that (check one and complete):

* (i) A Disclosure Statement Filing Due Date of _____ has been established with the cognizant Federal agency.

(ii) The Disclosure Statement will be submitted within the 6-month period ending _____ months after receipt of this award.

Name and Address of Cognizant ACO or Federal Official	Where Disclosure Statement is to be Filed:
_____	_____

DFAR 252.209-7001 -- Disclosure of Ownership or Control by the Government of a Terrorist Country (Mar 1998)

(a) *Definitions.* As used in this provision --

(1) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C.App. 2405(j)(i)(A)), to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.

(3) "Significant interest" means --

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) *Prohibition on award.* In accordance with 10 U.S.C.2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) *Disclosure.* If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include --

(1) Identification of each government holding a significant interest; and
(2) A description of the significant interest held by each government.

(End of Provision)

DFARS 252.227-7028 Technical Data Or Computer Software Previously Delivered To The Government (Jun 1995)

The Offeror shall attach to its offer an identification of all documents or other media incorporating technical data or computer software it intends to deliver under this contract with other than unlimited rights that are identical or substantially similar to documents or other media that the Offeror has produced for, delivered to, or is obligated to deliver to the Government under any contract or subcontract. The attachment shall identify-

(a) The contract number under which the data or software were produced;
(b) The contract number under which, and the name and address of the organization to whom, the data or software were most recently delivered or will be delivered; and
(c) Any limitations on the Government's rights to use or disclose the data or software, including, when applicable, identification of the earliest date the limitations expire.

(End of provision)

DFARS 252.247-7022 Representation Of Extent Of Transportation By Sea (Aug 1992).

(a) The Offeror shall indicate by checking the appropriate blank in paragraph(b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term "supplies" is defined in the Transportation of Supplies by Sea clause of this solicitation.
(b) *Representation.*
The Offeror represents that it--
☐ Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.
☐ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.
(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notice of Transportation of Supplies by Sea.

(End of Provision)